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AUTHOR Olson, John K.
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ABSTRACT

A preliminary case study used repertory grid and stimulated recall techniques to examine how teachers make sense of the impact of microcomputers on their work. Emphasis was on how teachers construe their classroom influence in relation to the actual use of microcomputers and to idealizations of their use. A version of the Kelly (1955) repgrid was used with two teachers who, in interviews, completed a projective-type test using their own constructions. Constructs were elicited by having teachers group 30 microcomputer situations and evaluate each situation in relation to each construct. Five constructs were provided and approximately five elicted to obtain a grid which was analyzed as a basis for developing a follow-up interview protocol. This report includes a review of related literature, a description of the general research methodology and specific strategies, examples of data collected from one teacher, a description of data analysis techniques, and preliminary results. Figures and tables include a list of events used as elements in construct elicitation, an example of a completed grid, an interview protocol, and a transcript of a conversation with a teacher regarding the situations. Examples illustrate the kind of data that emerge from the interview protocols based on grid analysis. Seventeen references are listed. (LMM)

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Microcomputers and the Classroom Order

John K. Olson
Queen's University
Kingston, Ontario
Canada

Paper presented at the Annual Meeting of the American Research Association, New Orleans, April 1984.

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MICROCOMPUTERS AND THE CURRICULUM

The title of this paper gives no clue to its finding a place within a symposium framework concerned about the relationship between how teachers think about their work and curriculum change. The classroom order I have in mind is the clue to this problem because understanding how teachers think about the way they order their life in the classroom seems to me to be central to any effort to reform the curriculum. What counts in the way classrooms work is what teachers do to make them work -- the routines that teachers establish; these routines comprise the classroom order and I would argue that if we want to understand them we will have to understand the purposes they serve, and only the teacher can tell us about those purposes.

Those who would wish to alter the routines of the classroom; those who want to get teachers to do things another way would be well advised to find out what it might mean to teachers to do things differently. Microcomputers, for some of those who advocate them are for them ikons celebrating new ways of educating children; for others the microcomputer is more like a trojan horse inside of which are forces which will disrupt the routines of the classroom. The advocates see a new order; one to which they hope to rally teachers, but teachers are concerned about the old order and its functions. How will these two universes interact?

My plea in this paper is for curricularists to seek a

greater understanding of the existing order of things in the classroom so that we who advise reform through new approaches might understand the significance of what we propose. It is only good tactics that I argue for here; I'll save questions of grand strategy for another day.

I see two reasons for taking a tactical interest in microcomputers at the moment. First, clearly there is considerable potential associated with this technology but little is known about how best to use it. The use of lesson and course ware poses many problems for teachers: expectations are high but technical capabilities of schools are not as high. In short, there are interesting research questions that can be pursued in the context of microcomputers and their use; the way teachers use them has the possibility to tell us much about the nature of classroom life itself.

Secondly, I want to suggest that it is worthwhile forging a strong link between development of CAI material and research into fundamental aspects of classroom life. Some of the work we have been doing at Queens is intended to forge a link between development and research. Forging such links allows various people to pursue related but different interests in a team approach. There is no doubt that funds do exist to do research on microcomputers and development work and I simply think it is worth combining development and research efforts to make the best use of such funds.

The relationship between research and development in the area of microcomputers and persistent problems in

curriculum I think is important. The rise in concern about computer technology brings with it increased attention to just what the whole curriculum should look like, and attention to just how teachers accomodate to new technologies, and how the curriculum plays a part in that process. These two questions I think are central to the curriculum field and they are also at the centre of the discussion about microcomputers in the classroom as well. Take the matter of computing itself as a curricular element, for example. I find that this school subject is beginning to attract the sort of rhetoric of expectations that one finds attached to older more established subjects in the curriculum. In the Ontario guidelines for the subject, for example, we find references to: problem solving; protection and enhancement of self image; listening skills; and so on. These concepts suggest that computers and computing are intended to be more than just tools and skills. Computers are being placed in another division distinct from typewriters and business machines; one doesn't find talk about self concept attached to learning how to type. For some, computers are central to school reform itself. Take LOGO; this isn't just another language to be learned; it is about thinking itself; a way of reforming the intellectual climate of schools claims Pappert (1980).

The talk of computer literacy and the attention paid to such arguments for helping children become familiar with the

technology shows just how central this new technology is for some people. It should be noted that scientific literacy type arguments for the place of science in the curriculum never did receive the same attention and respect as is given to those for computers in official documents and the popular press.

The really interesting questions emerge when we look at the computer as a basis for CAI or CAL as some prefer it. Decker Walker in his Kappan (1983) article on computers notes seven attributes of computer-based learning that are plusses; the list is impressive. Three interest me here: individually tailored learning; independent learning; and more active learning. These potentials for the technology raise interesting questions about the ways the technology will interact with how teachers prefer to run their classrooms. It may turn out that what computers might best be able to do is not the kind of thing teachers have ever been comfortable with. This is certainly a suspicion to be harboured.

Nonetheless there is no doubt that computers are special in the history of new technologies. They are not teaching machines; not the same as VCRs nor chalk boards; but how are they special? What are people claiming for them?

MICROCOMPUTERS AND THE CLASSROOM ORDER

Here I think recent research on the classroom impacts of computers is illuminating. We can begin to see some interesting research questions emerging from this literature. Behind the visionary claims being made for the technology, questions about the effect of microcomputers on the stabilities of classroom practice are emerging. I would like to point to these through a review of recent research. Having done that I want to return to a discussion of research now underway at Queen's which is beginning to pursue some of these questions. I will discuss that research within a framework that takes the teacher's perspective seriously; that locates the classroom order in the mind of the teacher.

Research reports I have looked at recently suggest that the social dimension of computer use is important. Jan Hawkins (1983) reports that the group at Bank St. College hoped that doing LOGO would promote collaboration amongst children. However, instead of collaborating the children consulted each other but did their own work. The children did not seem to value collaboration and did not share the researchers enthusiasm for collaborative learning. In reading this I wondered what the teacher thought of collaborative learning. There is always a danger that the researcher, having a commitment to particular forms of classroom organization, looks for those forms in the new

technology and is disappointed not to find them. I am reminded here of the open education literature and the search by proponents for the desired forms in the world of practice. The Berlaks (1975), for example, did not find in England the kind of open education in practice that they hoped they would. While children using microcomputers might have the potential for promoting collaboration that Jan Hawkins was looking for, my point here would be that it would have to be realized through the teacher. The teacher is the one who is ordering the life in the classroom, not the microcomputer.

Hawkins' work raises the further question of the role of print materials and teacher guides. Perhaps the possiblity for collaboration was not built into the supporting printed materials, or if it was, it did not affect the way the teacher and the students used the material. Parenthetically, there seems to be much stress on quality programming in the literature but less attention given to the nature of support material. Often children must interact with only one microcomputer in the classroom and have to rely on print materials to help integrate the computer work with other activities.

Hawkins raise a central question about the indeterminate status of the computer in the classroom. Children consult together now because the work they do on the computer often isn't mainstream--not serious. What will happen when the work is serious and grades depend on it? Will such

fundamental issues for classroom life act as barriers to realizing the potentials of computers?

Hawkins notes that the way the materials are used does depend on their overall design and the way teachers use them, although she does not document these matters in her report. Documentation of the interaction between particular designs of computer materials and how teachers use them and to what effect would make interesting research projects.

Marjorie Rogosa's (1979) study of CAI used for remedial purposes documents one of the fears that teachers have about CAI; the fear they cannot keep up with their class. She found that teachers were worried about the flow of their classrooms being disrupted by the way the CAI materials were organized. Ironically the individual rates of progress that so concerned Rogasa's teacher are said to be one of the virtues of the technology; but apparently not entirely a virtue for teachers. Richard Carlson (1965) found this out when he studied teachers using teaching machines; teachers in his study made sure that relatively homogeneous rates of progress through the material were maintained. Why teachers do this is a very interesting question.

Brine (1982) suggests that the computer can be used to shift the social climate of the classroom away from competition to collaboration, and he is concerned that the computer will in fact promote competition through the rush in the classroom for scarce resources.

A change in student-teacher relationships is the implied norm in the Hawkins and Brine papers. It is not clear, however, how teachers might view this norm. Do teachers want to promote collaborative relationships within their classroom. Is this what it means for them to have a computer in your classroom? What do teachers think about this idea? Although thinking about the potentials of the computer is important, I think it is also important for these norms to be looked at from the perspective of the teacher. How might research be conducted within the framework of such a concern? This question brings me to a discussion of our research into how teachers think about the impact of microcomputers on the classroom order.

We are interested to find out what it means to teachers to work with microcomputers in their classrooms. Rather than focus on the visions of a new intellectual medium, we want to find out what teachers make of the technology in the way they use it. What challenges to the practical theories of teachers are posed by microcomputers? And particularly what challenge to how teachers construe their <u>influence</u> in the classroom; a concept I will return to briefly later.

I think research like this has the potential to inform those who plan teacher inservice courses and those who write the critical support documents that ought to go with the program disks and this is where I see research and development joining together. Through joint effort people who engage in teacher education can begin to probe teacher

thinking about microcomputers and people who design lessonware can investigate some of the factors that should be considered in developing effective guides to lessonware in support of what is seen on the computer.

Decker Walker warns us about what might happen if we are not careful in the way microcomputer potentials are promoted. He notes that they are hard to use and that there is much upset to routines associated with them. The rhetoric surrounding computers stresses breakthrough and innovation at a fast pace. Where is the teacher to place him/herself in all of this? What would a settled form of the technology look like from a teacher's perspective? Shouldn't we know something about how teachers see the technology in the classroom as part of the process of putting together school oriented machinery and software? Given these concerns it becomes important to know how teachers think about using microcomputers in their classrooms. How to research such a problem and with what sort of theoretical perspective in view?

RESEARCHING THE TEACHER'S PERSPECTIVE

We have now completed the field work and data reduction of a pilot study of two teachers who worked with us in the development of lessonware. As an adjunct to their work in field testing the materials we developed, we asked them to participate in a small scale research project using clinical interview techniques developed within a qualitatively

oriented research framework (Olson, 1984). The data have not yet been fully analysed so the comments here as far as results go are preliminary.

In what follows I will outline the general approach and say something about the specific strategies we used in the pilot study and end by taking a look at some of the data we have collected, how it was analysed and what seems to be emerging from it; all of this by way of illustrating one way in which we can gain some understanding of teacher perspectives.

To sum up this part of the discussion, our research is premised on the idea that knowledge about how teachers think about their practice is an important element of the data base needed to create effective curriculum development and teacher education policies.

There have been a number of studies into teacher thinking about innovation in areas like reading (Dufy, 1976), open education (Bussis et al, 1976) and integrated science (Olson, 1980). Much of the focus of existing research on microcomputers has been on their potential to promote intellectual growth (Pappert, 1980), or on how students and microcomputers interact (Pea, 1983; Brine, et al, 1983). We know very little about the patterns of use of microcomputers in elementary classrooms and the reasons for these patterns, and less about what teachers think about these patterns and the teacher's role in the creation, maintenance, and change of those patterns.

There is reason to think, however, that there may be difficulties ahead for teachers attempting to alter their classroom patterns to accomodate microcomputers. Research we have conducted with science teachers, for example, suggests that if teachers do use computers in the way many proponents suggest, they may face what might be called an erosion of their influence; for example, it is not all that clear that teachers favour student independence. There is a large body of research that suggests that teachers tend to maintain control over the point and direction of the lesson (Calderhead, 1983; Larson, 1984) and that this control is maintained at the expense of the potential of the innovation. Carlson's (1965) classical work on teaching machines, as I have noted, showed that teachers arranged class activities so that uniform progress of the class was maintained in spite of the potential of the machine to allow for individual rates of progress, and added to this is the part that some student capabilities with microcomputers pose an interesting challenge for teachers. This particular issue is one we are trying to pursue.

Our work on teacher influence indicates that teachers run into difficulties when they believe that their influence over the point and direction of their lessons is diminished. Inquiry oriented science materials, for example, pose difficulties for teachers which they believe have to do with loss of influence (Olson, 1981), and the results of a recent major study of science education in Canada suggest

that this is a common phenomenon across divisions of the curriculum (Olson and Russell, 1983). Microcomputer technology might also represent a perceived threat to teacher classroom influence and we might find that intellectual potentials of technology are diminished as teachers modify their use of it in accordance with their overarching concern to preserve influence. Elsewhere I have argued that there are two distinct forms of teacher influence in the classroom; each of which is represented by particular teacher-student interactions and each with particular teacher-student interactions with particular implications for how the teacher views the teaching task (Olson, 1981). Low influence teaching is seen to be highly problematic for teachers. Although these views about influence are tentative, such a framework looks as if it has promise as a guide to research activity in the field of teacher thinking and curriculum change. The concept is discussed at greater length in various of the references.

The research we are now conducting starts from four questions:

1. What kinds of goals do teachers seek in their use of microcomputers; what balance exists between socialization and education goals and are there conflicts between such goals?
2. How do teachers construe their influence over classroom events involving microcomputers?
3. What contextual factors affect the way teachers con-

strue their influence in the classroom when using microcomputers: knowledge of microcomputers; abilities of children; access to courseware and other support; class behavior?

4. Do teachers differ across school divisions in the way they construe their work with microcomputers, and in the factors that affect how they view their work?

The research methodology is based on the idea that what people say they do and what they do are not always the same. Means must exist to check one against the other. In order to probe teacher thinking about microcomputer use a version of the Kelly (1955) repgrid is being used. In interviews teachers complete a projective type test which makes use of their own constructs. In order to elicit constructs 30 microcomputer "situations" are presented to teachers (See Table 1). They are asked to group these situations according to some underlying commonality, and to describe the commonality and to contrast it with its polar opposite. The 30 "situations" have been drawn from a content analysis of approaches to the use of microcomputers found in the pedagogical literature associated with the technology and from comments about practice obtained from the teachers in preliminary interviews. Once constructs are elicited, teachers are asked to evaluate each situation in relation to each construct (See Table 2). Five constructs are supplied and five or so elicited. In this way a grid is obtained which is being analysed in a number of ways, including

factor analysis. Each grid is analysed as a basis for developing a follow-up interview protocol (See Table 3). In this interview teachers are asked to comment on their grid and it is here that teacher thinking is probed in depth. The interview is tape recorded.

These data are being analysed in relation to the research problems. Teacher thinking about microcomputer use will be drawn from a content analysis of their comments on the grids, and from the grid data themselves, amongst other sources of data. In further research beyond the pilot phase we are now in, teachers will also be asked in informal interviews to comment on contextual factors. These comments will be related to their grid material.

As a check on what teachers say they do, teachers will be asked to review a videotape of a classroom activity involving their use of microcomputers and to give a running commentary on what they and their students are doing. This stimulated recall method is commonly used as a way of asking teachers to explain their classroom activity, and as a basis for probing their thinking about practice. It also acts as a check on the interpretation of other data collected.

What have we found from these preliminary efforts to understand how teachers see the use of microcomputers in their classroom?

We asked Mrs. M to sort the 30 teaching events (Table 1) into groups using categories she felt were important. Once she had done this we asked her to describe the

1. A student has "crashed" the program and has asked the teacher for help.

2. Some students are talking with a pair of students working on the computer and distracting them.

3. A computer experienced student arrives from another class to help the teacher with a problem.

4. The teacher asks the student to do a tutorial on the computer. The student asks to have a game.

5. The teacher is removing a stuck diskette from the disk drive while impatient students wait.

6. The tutorial program a student is working on gives an answer the student does not agree with. The student calls the teacher over.

7. The computer asks a student to hypothesize. The student is stuck and asks the teacher for help.

8. Students are programming music on the computer. Other students at their seats stop their work to listen.

9. The teacher is using a computer at her desk to make up a multiple choice test.

10. As planned two students have left the room to do Logo on the computer in the hallway.

11. Some students are asking to spend their recess at the computer.

12. A student asks the teacher to do a BASIC operation on the computer. The teacher doesn't know how.

13. Some students seem to copy work from their partners.

14. One student does not want to work with another student at the computer.

15. A student tells the teacher she was bored with the tutorial she is doing.

16. The teacher has stopped the class so that a pair of students can explain a programming routine they have just completed.

17. The class is going to the library to do math tutorials on a bank of machines there.

18. A student doing word processing says she's shy about people seeing her work and asks for the machine to be moved.

19. A student wants to list the program of a piece of software and modify the program.

20. The computer has to leave the classroom before students are finished with the program they had been working on.

21. A few students asks for more of their math work to be based on the computer.

22. A group of students have not completed their work on the computer in the allocated time. They want more time.

23. A long line of students has formed at the computer waiting their turn.

24. Students did not read the instructions in their workbook and are asking for help at the computer.

25. Some students are 2 or 3 lessons ahead of the rest of the class. They are asking for more work.

26. Some students are doing math problems on the computer that are part of the next grade.

27. A boy tells another student to hurry up and finish at the computer. The student objects.

28. The teacher is having difficulty leading a brain storming discussion aimed at discovering the nature of a simulation the class has been studying.

29. A teacher is asking a pair of students to hurry up their work on the computer. They say they do not understand the instructions.

30. Students who finish their work early are playing a game on the computer.

Table 1 Events used as elements in construct elicitation

AMBIGUOUS SITUATION UNAMBIGUOUS SITUATION

DOES CONSTRUCT APPLY TO SITUATIONS?

CLASSROOM SITUATION #	A DEFINITELY APPLIES 1	APPLIES SOMEWHAT 2	WEAK APPLI-CATION 3	B WEAK APPLI-CATION 5	APPLIES SOMEWHAT 6	DEFINITELY APPLIES 7	UN-RELATED TO A & B 4
1	✓						
2					✓		
3				✓			
4		✓					
5		✓					✓
6		✓					
7		✓					
8					✓		
9						✓	
10				✓			
11		✓					
12	✓						
13		✓					
14		✓					
15		✓					

Table 2 Example of a completed grid

Interview Protocol (M.S. March 8)

Element	Question
4	In what sense are students taking advantage? Where is the waste of time risk?
6	Where is the with it risk in the answer disagreement?
7	Why is hypothesize stressful/a with it risk and also needing high monitoring.
13	Why is taking advantage not applicable to copying?
15	Why is the bored student stressful/a with it risk and also high monitoring/taking advantage?
16	Why is student report on programming a with it risk?
21	Elements 16 and 21 seem to be similar situations. Are they?
22	What is the monitoring problem with students who haven't finished in the allocated time?
24	Why is not reading workbook more of a taking advantage than not finishing in allocated time? (22) And also a higher waste of time risk?
25	Why is students being ahead of the class stressful and a with it risk? But not a monitoring or waste of time risk?

* Constructs are underlined

Table 3 Interview Protocol

categories and in this way five constructs were elicited. These were: stressful/unstressful; being "with it" risk high/low; high monitoring required/low; students taking advantage risk high/low; waste of time risk low/high. These constructs were placed on a checklist sheet (Table 2) along with supplied constructs, and Mrs. M was asked to construe each teaching event using each construct. In this way a 30 x 10 matrix of data was obtained. Subsequently correlation amongst the constructs were obtained and that matrix was factored.

With these data in hand we can begin to explore the way Mrs. M construed the teaching events related to the use of the computer. First we found the following constructs loaded on the first factor: teacher response tightly related to student characteristics (0.67); higher monitoring required (0.86); student taking advantage (0.87); and waste of time risk low (-0.83).

The following constructs loaded on the second factor: ambiguous (0.73); stressful (0.85); and with it risk high (0.91).

The point of the factor analysis is to probe for relationships amongst the constructs--to see if some constructs may be different ways of expressing the same concepts. So, for example Mrs. M tends to see in the same events a need for high monitoring, the possibility that students are taking advantage and a high risk of wasting time. Similarily situations where a "with it" risk was

perceived were also seen as stressful and ambiguous. We are interested in these similar constructs because we think they represent different but related ways in which Mrs. M construes her influence in the classroom. The notion of influence goes beyond classroom control to include the way Mrs. M expresses her teaching as a person as well as how she acts instrumentally to help her students learn. Clearly both aspects of her work are important, but the expressive component is currently of most interest to us.

Our follow up interview with Mrs. M was intended to help us understand better what she meant by her constructs. In order to probe further these meanings a follow up interview took place using questions based on the way she had completed her checksheet (Table 3). The interview lasted for an hour and was tape recorded and transcribed.

To explore what Mrs. M meant by her constructs we chose to discuss with her situations in which there seemed to be a well defined application of constructs to a situation. This situation was then discussed using Mrs. M's terms in an attempt to see how she construed the situation; in this manner we discussed ten situations. Space doesn't permit an extensive treatment of them all and we haven't yet really worked through to a relatively comprehensive picture of Mrs. M's perspective; thus the following discussion is quite preliminary and tentative; but illuminating we feel.

CONVERSATIONS WITH MRS. M.

Situation Four: [The student who would rather play games than do a tutorial.] We asked Mrs. M.: "In what sense are the students taking advantage? Where is the waste of time risk?"

Q The teacher asks the students to do a tutorial on the computer and the students ask to do a game. And you've suggested that students are taking advantage of the teacher. I just wondered what the type of advantage was.

A It's the one where they try to either see if they can wear you down, so if they nag you long enough, or they bug you long enough, they can end up doing what they want.

Q Getting their way?

A Thinking that you don't either have the time to spend on explaining it all to them and why. Or that, you know (how children are) with parents. If you bug them about it long enough they get so sick of you that they'll let you do what they want. So that's a typical kind of situation.

Q So you sense the kids...?

A He wants to do something that he thinks may be more fun, rather than the tutorial which may be a little more work for him.

Q It would seem as a waste of time?

A Yes. The amount of time that you can spend ... Well if you let yourself fall into that trap - of negotiating. And then, secondly, if he ends up having to do something that he really doesn't want to do, is he going to be serious about it, or is he just going to play around ...?

Q So already that kid has to be watched ...?

A Yes. He's trying to signal he is resistent to this learning activity and I think you've got to do something about that. Is he going to get anything meaningful out of what you want him to do?

Q Teacher high monitoring indication there, which is consistent with what you've said. So he needs to be watched?

A Right. And why it wasn't stressful is because that's such a typical situation - we do that all the time.

Q Nothing new as far as computers go?

A Yes.

Q So in a sense you're saying kids often want to do something that they would rather do, that you don't want them to do, and there is nothing special there for computers - there's no extra edge here in the sense that ...?

A Right, it's probably even less stressful because almost anything they do on computers they enjoy, and so it's not even as hard as, well, instead of writing extra spelling words three times each, you know. They'd rather do a spelling bee or something. As long as it's on the computer, they are going to enjoy it more than other choices. So, even if you give way, they are going to get something out of it.

Q So, even if you let them do it on the computer, their attitude is better?

A Yes, their attitude is better towards any task involving the computer than if they have to do something that's the regular.

Q So even though they do a tutorial on the computer, the edge is off of it. If you're going to do spelling words - that's really boring.

A Yes, so he'd say, well O.K. if you don't want to do it on the computer, how about you just go back and do your seat work instead. Well then, they will decide to stay on the computer.
[Laughter]

The fact that the student wants to play a game isn't anything new. In a sense children are always nagging teachers about doing something else. The interesting point about the computer for Mrs. M. is that even having to do the tutorial is still better than being back at one's seat doing

something there. This kind of "negotiation" however may end up as a waste of time; partly, perhaps, because the child who has signalled his disinterest has to be watched - is she/he getting on with it? The student may be working at the computer but how does the teacher know that he/she is getting anything out of it; especially those students who the teacher knows need to be monitored. Usually the teacher can monitor these students quickly at a distance. As Mrs. M. suggests monitoring isn't that easy where computers are concerned because it isn't that clear where the student is at.

Situation Six. [The student doesn't agree with the answer in a tutorial problem and calls the teacher over]. We asked Mrs. M. "Where is the 'with it risk' in the answer disagreement?"

Q I'm just wondering what's at stake there for you as a teacher when a kid does something like that?

A I'm thinking of somebody who doesn't have much background, either working with a computer, or, you know, knowledge of the computer programming; so that if there's a flaw in there, the teacher may not be able to diagnose where it went wrong. So there you are exposing your ignorance of working with computers, and you're no longer the source of knowledge for the child that they expected you to be; (to have) that sort of credibility. Whereas Whereas in most other subjects in the classroom, if they run into a difficulty with something in the textbook, you can always put the pages back. You're likely to be so familiar with all of that work that you've got the right answer ready, and you can spot immediately, say if they are working on a fraction problem, you can spot right away: "Well you didn't multiply by ..."

Q You can't back it up? Is it that??

A Well, if you're not conversant with how a computer operates you may not even know where breakdowns can occur, and then you would be totally lost.

Q Right. Well this may not be a breakdown. It could be just a situation where the kid didn't get the right answer. Look it up in the back of the math book - answer doesn't agree, sort of thing. That can happen.

A Yes. But then you could probably work it out yourself pretty quickly and see what the problem is.

Q Right.

A But with computer work you may not always have the background knowledge to be able to do it.

Q Unless you know the tutorial problem very well.

A Right.

Q In which case you might.

A Yes.

Q Or am I putting words in your mouth?

A No. That's what I meant. Just a very simple thing - like you misread a direction, or you punched in the wrong number of candles, or something.

Q Yes and that's ...

A And then you get just a little bit uptight, because if you don't solve this problem this whole thing is going to be lost and secondly, you just feel a little more threatened because you're so used to being able to solve problems, that now when you can't, you ....

Q Yes - I have the same feeling with my daughter's Grade 9 math problems sometimes. Is it like that?? When you can't dodge back and ...

A Yes. Because I think we're all at the stage where we have competence in areas that we're quite used to and that we can handle quite well and being able to pass along.

Q Yes. So this may be a special edge on the computer that's newish.

A Yes.

Q O.K. I understand that now. There's a high monitoring in that.

A Well, that's because you have to work through a whole series of steps with them all over again, and just see the breakdown happen. You have to go back over the problem.

Q Right - so monitoring to some extent means literally one-to-one teaching?

A Yes, that's what I think it is.

Q One-to-one teaching?

A Yes, you are right there watching them do it, and you have to be totally involved with it. And you can't be distracted because you could miss something important.

Q Then monitoring is shifting off total class, to focus on an individual kid - somehow, either face-to-face or keeping an eye on that kid. Would that be part of monitoring?

A Well, mostly I was just taking it as that you had to be there and watching what they were doing.

Q Even if you were just watching over their shoulder, but you had to be involved in what they were doing to be able to either see whether he was making mistakes, or whether he was following the right sequence of steps, and ...

A Yeah. When I'm not as sure of what I'm doing then I feel a greater need to be closer by.

Q I'm just trying to see whether monitoring has any distance factor in it for you.

A Well, when you can't really spot at a distance when they are at a computer, because they could be putting in silly names.

Mrs. M. focuses on the technical problem that might be causing the difficulty rather than the idea that the student has simply come up with an answer that diverges from the "book". In the case it isn't a book but a computer and Mrs. M. feels at risk because she cannot go back into the "book"

and if the right thing isn't entered into the computer things may not work. A book doesn't fall apart when you write down the wrong answer. In a sense the right answer turns the pages of the computer. You can't turn the pages if you don't get the answer right and you can't look back. It is all buried in the program. In a sense the computer is a black box and you can't look inside. Monitoring means working closely with students -- finding out where they are at. Are they stuck? How can they be unstuck? The computer seems to represent a new kind of "stuckness" and requires a level of monitoring seemingly more intense and demanding than Mrs. M. normally has to engage in. To be helpful she has to be quite close up to what the student is doing and even then there is no guarantee that she'll be able to spot the problem. At risk here isn't only her capacity to help, but her sense of being a "with it" teacher; someone students can rely on.

Situation 7 [Here the student has been asked to hypothesize and is stuck]. We asked Mrs. M: "Why is 'hypothesize' stressful, a 'with it' risk and also needing high monitoring?"

Q The student is stuck and asks the teacher for help. Now this one came out as needing high monitoring. What's happening here with hypothesizing?

A Well, it's a very high level activity, where not all students are really at that stage where they can do that. And so, you have to pose the right series of questions to have things work up to that level. And so there is a very one-to-one interaction.

Q Quick thinking on the part of the teacher?

A That too.

Q Is there a temptation to do it for them?

A Sure - because, if it's a slow person and they are taking a lot of time, and, especially if it's obvious to you, you get a little impatient there, and if it's the fourth person that afternoon that has run into the same problem, you're kind of tired of going through that sort of sequence.

Q So you kind of ...?

A Well you try not to but...

Q The temptation...?

A By the fifth person you're tempted! [Laughter]

To the extent that the computer asks students to engage in high level thinking there is a monitoring demand if students cannot do this alone. How well will this square with the expectation that computer programs are "stand alone" and not only alone without the usual print matter that teachers rely on, but apart from the teacher? Again the need for close contact with what the student is doing seems to be seen as a special demand on the teacher.

Situation 16. [The teacher has stopped the class so that a pair of students can explain a programming routine they have just completed]. Situation 21. [A few students ask for more of their math work to be based on the computer]. Why is a student report on programming a "with it" risk, we asked Mrs. M.. We also asked: "Elements 16 and 21 seem to be similar situations; are they?"

Q The student report is a with it risk. Why is that?

A Well for me it wouldn't bother me, because I like to give them lots of opportunities where they can sort of shine at something, and have the chance to show leadership.

Q It generally fits into your work?

A Oh yes. If you can't do it yourself, get somebody who can.

Q Right. It's just occasionally I suspect there are some feelings that..?

A Well, you think that you should find more about this, and then it's frustrating because you don't have the time or the inclination - or the aptitude, not the inclination, but you don't have the aptitude.

Q Right - It's the mental set.

A Right. Kids tend to pick it up and you think, maybe if I made more of an effort on that I really would. But this doesn't bother me that much, but I know of other people who really get uptight about that kind of thing.

Q And it's not a thing to do with young teachers/old teachers either?

A No, because it is a difference in aptitude and interests. I'd be willing to venture that the people who have done the least to develop themselves and who have the narrowest frames of interest in their own lives are the ones who are most threatened by anyone else showing any kind of expertise in a subject that they don't have, and yet they don't make any effort to further themselves in it too.

Q The computers may have an edge to this. Where you can't budge it so easily.

A Well computers will make it even worse.

Q Questions 16 and 21, the business of the report, and 21, students asking for more of the work to be based on the computer, seem to be similar problems. Are they?

A Yes.

Q In those two cases where the kids are showing off there, and these kids who <u>are</u> saying give us more

math work on the computer. What might be similar?

A Well, the teacher may not be able to do that because she doesn't have the skills and the programming, or access to the material there.

Q You're on the spot?

A You're on the spot, right. You're somewhat at risk because you're so used to being able to hand out all kinds of dittos and you've got math questions all ready.

Q Yes?

A Yes, right here - some problems to solve, but now you're asking for something in another area, and you're not prepared.

Q Your racket has no string.

A Right.
[Laughter]

Q So the kids who want more math work - are these perhaps the same kids who are showing off their programming?

A Well, if they are the ones who can do it, then I'd say O.K. Lets see what you can do. Put one on there then.

Q Advance your own program?

A Yes, go ahead.

Q But you feel on the spot?

A But if they are the game players who just want to do it. Like this, again, I took this as a double edge there. It could be that they're the ones who are challenged and motivated and very competent, or, are these people who just want to play some more on the computer? And that's where wasting time comes to light.

Q Although you didn't put that students were taking advantage.

A I thought of that a bit.

Q A little bit?

A A little bit, because it depends on the students

involved and the motivations. But even if they're the ones who are the game players and who want more math. Some people who are that way, I look at that as the positive, because they could do a lot of math drills, you know, without thinking that it was drudgery.

Q And now we have the computer which adds that little bit extra.

A Yes, and the computer sort of carries on with that stuff for the television generation - lots of action and intricate play. And you're involved, yes - liven up the program and it makes it more fun for them. Like, it has to be fun - nothing can be hard work and drudgery.

Q I just wonder if there's that little extra added edge with the computer?

A It feeds that urge to have fun, but you can't really deliver all that. Because you don't have enough time and they still have to be agile to go through those steps. And it requires a certain amount of patience - if you don't work through the required number of steps the thing doesn't work.

Q That's right. And then they get frustrated.

A And they get frustrated - right, or they say they're bored because, then again, it turns out that they had to work through all these steps.

Q They thought it was going to be fun, but it turns out not to be fun for them. So you've got a double problem.

A Yeah. They're expecting fun and they have to go through all these other steps before they get anything out of it.

Q It sounds like a bind for the teacher.

A Yes.

Q You know that - Give us more, but don't give us more. Because we're suddenly finding out that we have to work.
[Laughter]

Although Mrs. M. indicated that there was a "with it" risk attached to students giving a report she prefers to think that such a report is simply another example of

students showing and telling. Yet the computer clearly represents a technical challange to her and other teachers. The demand for more math on the computer raises questions of skills in developing material. Supplying computer experiences isn't the same as giving out dittos, as she puts it aptly. The students who are the computer whizzes are putting pressure on the teacher to liven things up. The computer caters to the students' desire to have fun; but there is a twist in the tail as Mrs. M. sees it. There are the "steps" to go through in computer assisted learning and they require patience. It isn't all fun, and some are going to be frustrated and so there may be a backlash. The computer oriented students may find that the fun they had hoped for isn't there. The computer makes demands on them to get the steps right -- just as it demands that Mrs. M. get them right.

CONCLUSION

These short extracts illustrate the kind of data that emerge from the interview protocols based on grid analysis. These data however are radically incomplete, as is the analysis at this time. We need to check the interview material with classroom observations data and with children's work and thoughts. The theoretical context in which this talk about Mrs. M.'s influence has not been developed here although we hope the possiblity for learning more about how teachers construe their influence is

suggested. One of the overall aims of the research program we have planned is to analyse these data in relation to a developing theory of teacher influence in the classroom and the implications of that theory for curriculum reform.

The kind of thinking we have been looking at in the case of Mrs. M. has much to tell us about the way she orders her classroom and the kind of impact microcomputer technology will have on that order. Those who plan lessonware, teacher inservice and who consult with teachers might be wise to probe the ordering of the universe they plan to shift. We think that microcomputers are having an impact on the way teachers construe their influence both instrumentally and expressively and we can begin to see how the expressive and the instrumental elements interact in a complex ordering of classroom life.

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